

Notice of Allowability

Application No.

10/727,604

Examiner

Ram N. Kackar

Applicant(s)

OH ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 1/4/2006.
2. ☒ The allowed claim(s) is/are 9,10,12,13,15-17 and 19.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Claims 9, 10, 12, 15-17 and 19 are amended as below:

Claim 9 A status monitoring apparatus for monitoring an operating status of a plasma processing apparatus and/or a processing status of an object being processed, based on a result of analyzing light emitted from a plasma generated while the plasma processing apparatus performs a plasma process on the object in a processing chamber, the status monitoring apparatus comprising:

a unit configured to obtain an emission spectrum emitted from the plasma when the plasma process is performed on the object;

a unit programmed ~~configured~~ to obtain quantitative data for each of a plurality of emission sources from the obtained emission spectrum by using reference data in a database ~~storing~~ having stored therein an emission spectrum for each of the emission sources as the reference data, wherein the unit ~~configured~~ programmed to obtain the quantitative data determines an inner product value between the emission spectrum obtained by the plasma process and the reference data, and sets the inner product value as the quantitative data; and

a unit programmed ~~configured~~ to estimate the operating status of the plasma processing apparatus and/or the processing status of the object being processed, based on changes in the

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quantitative data for each of the emission sources, wherein the reference data is obtained using an independent component analysis, and the emission spectrum for each of the emission sources correspond to an independent component obtained by the independent component analysis.

Claim 10 The status monitoring apparatus of claim 9, wherein the database is created in advance by a unit configured to obtain a set of emission spectra, each emission spectrum of the set being emitted from a plasma during each plasma process performed under various process conditions; and

a unit ~~configured~~ programmed to separate the set of emission spectra into the emission spectrum for each of the emission sources by ~~a multivariate~~ the independent component analysis and to store the separated emission spectrum as the reference data.

Claim 12 The status monitoring apparatus of claim 11, 10 wherein the number of independent components obtained by the independent component analysis is greater than or equal to the number of process gas species used in the plasma process.

Claim 15 The status monitoring apparatus of claim 9, wherein the unit programmed ~~configured~~ to estimate the operating status of the plasma processing apparatus estimates that the operating status of the plasma processing apparatus is stable when the quantitative data for each of the emission sources become stable after the plasma processing apparatus begins to perform the plasma process.

Claim 16 The status monitoring apparatus of claim 9, wherein the unit programmed configured to estimate the processing status of the object being processed estimates a completion of the plasma process for the object based on changes in the quantitative data for each of the emission sources.

Claim 17 A status monitoring apparatus for monitoring an operating status of a plasma processing apparatus and/or a processing status of an object being processed, based on a result of analyzing light emitted from a plasma generated while the plasma processing apparatus performs a plasma process on the object in a processing chamber, the status monitoring apparatus comprising:

means for obtaining an emission spectrum emitted from the plasma when the plasma process is performed on the object;

means for obtaining quantitative data for each of a plurality of emission sources from the obtained emission spectrum by using reference data in a database ~~storing~~ having stored therein an emission -spectrum for each of the emission sources as the reference data, wherein the means for obtaining the quantitative data determines an inner product value between the emission spectrum obtained by the plasma process and the reference data, and sets the inner product value as the quantitative data; and

means for estimating the operating status of the plasma processing apparatus and/or the processing status of the object being processed, based on changes in the quantitative data for each of the emission sources, wherein the multivariate analysis used for obtaining the reference data is an independent component analysis, and the emission spectrum for each of the emission

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sources corresponds to an independent component obtained by the independent component analysis.

Claim 19 The status monitoring apparatus of claim 17 ~~18~~, wherein the number of independent components obtained by the independent component analysis is greater than or equal to the number of process gas species used in the plasma process.

Claims 1-8, 11, 14 and 18 are canceled.

Claim 13 is not amended.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Edwin D. Garlepp on 3/30/2006.

REASONS FOR ALLOWANCE

2. The following is an examiner's statement of reasons for allowance:

"A unit programmed to estimate the operating status of a plasma processing apparatus based on changes in the quantitative data for each of the emission sources obtained by calculating an inner product value between the plasma emission spectrum and each emission source, wherein each of the emission sources corresponds to an independent component obtained by an independent component analysis of the whole plasma emission spectrum" is not fairly suggested on disclosed in the prior art in the context of the claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ram N. Kackar whose telephone number is 571 272 1436. The examiner can normally be reached on M-F 8:00 A.M to 5:P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571 272 1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Ram Kackar
Primary Examiner AU 1763